PATENT ABSTRACTS OF JAPAN

(54) NETWORK SYSTEM, INFORMATION TRANSMISSION RECEPTION TERMINAL, INFORMATION SERVICE DEVICE AND NETWORK BUILDUP METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To prevent a heavy load from being imposed on a network by connecting a client not connected to a multi-cast network to a connecting point of an optimum multi-cast network.
SOLUTION: A client 5 transmits connection request information and its own position information to a server 2. The server 2 retrieves a connecting point of a client 5 to be connected to a multi-cast network on the basis of position information of the client 5 received from the client 5 in response to connection request information received from the client 5. Then the server 2 or a client 6 that is a connecting point retrieved by the server 2 uses tunneling to transmit multi-cast data to the client 5 via a router 3 and/or a router 4.

1
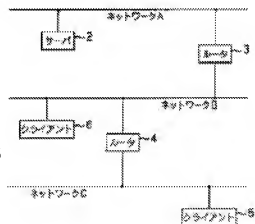
[Claim(s)]

[Claim 1]To multicast networks to which multi cast data reproduced by only information sender receiver terminal which requires reception are transmitted. The above-mentioned multi cast data in which tunneling which carries out interconnection was used between networks corresponding to these multicast networks as unicast data directly transmitted for every information sender receiver terminal from an information providing device. The 1st information sender receiver terminal to connect via information repeating installation treated the above-mentioned multi cast data, In a network system which builds a course of a network received from an information providing device or the 2nd information sender receiver terminal which belongs to the above-mentioned multicast networks and holds the above-mentioned multi cast data, An information sender receiver terminal of the above 1st is provided with an information transmission means which transmits connection request information and self position information which require connection with the above-mentioned multicast networks to the above-mentioned information providing device, According to connection request information received from an information sender receiver terminal of the above 1st, the above-mentioned information providing device, It has a search means which searches for a node which an information sender receiver terminal of the above 1st connects to the above-mentioned multicast networks based on position information on the 1st information sender receiver terminal that received from an information sender receiver terminal of the above 1st, A network system, wherein an information providing device or the 2nd information sender receiver terminal which is the node for which it was searched by the above-mentioned search means transmits the above-mentioned multi cast data to an information sender receiver terminal of the above 1st via the above-mentioned information repeating installation using the above-mentioned tunneling.

[Claim 2]According to information that the above-mentioned information providing device has distributed the above-mentioned multi cast data, the above-mentioned information transmission means, By supplying multi-cast-data request-to-receipt information to demand, receiving the above-mentioned multi cast data from the above-mentioned information providing device, The network system according to claim 1 transmitting connection request information and self position information which require connection with the above-mentioned multicast networks to the above-mentioned information providing device.

[Claim 3]An information sender receiver terminal of the above 1st is provided with an operation input means as which request-to-receipt information which requires reception of the above-mentioned multi cast data is inputted, and the above-mentioned information transmission means, The network system according to claim 1 transmitting the above-mentioned connection request information and position information to the above-mentioned information providing device by supplying the above-mentioned request-to-receipt information from the above-mentioned operation input means.

[Claim 4]An information providing device or the 2nd information sender receiver terminal which is the above-mentioned node which was provided with the following and detected by the above-mentioned detection means, The network system according to claim 1 characterized by transmitting the above-mentioned multi cast data to an information sender receiver terminal of the above 1st via the above-

mentioned information repeating installation using the above-mentioned tunneling.

A recognition means to recognize IP (Internet Protocol) address of an information providing device connected to the above-mentioned multicast networks, or the 2nd information sender receiver terminal according to connection request information which received the above-mentioned search means from an information sender receiver terminal of the above 1st.

An IP address recognized by this recognition means.

A comparison means to compare an IP address of an information sender receiver terminal of the above 1st.

A detection means to detect an information providing device or the 2nd information sender receiver terminal which is a node to the above-mentioned multicast networks based on a comparison result compared by this comparison means.

[Claim 5]The network system according to claim 1, wherein the above-mentioned information providing device is provided with a course disappearance means to extinguish a course of a network connected by information sender receiver terminal of the above 1st according to fulfilling predetermined conditions.

[Claim 6]From an information providing device or the 2nd information sender receiver terminal which belongs to multicast networks to which multi cast data reproduced by only information sender receiver terminal characterized by comprising the following which requires reception are transmitted, and holds the above-mentioned multi cast data. The above-mentioned multi cast data, An information sender receiver terminal which receives via information repeating installation treated as unicast data in which the above-mentioned multi cast data in which tunneling which carries out interconnection of between networks corresponding to the above-mentioned multicast networks was used was directly transmitted for every information sender receiver terminal from an information providing device.

An information transmission means which transmits connection request information and self position information which require connection with the above-mentioned multicast networks to the above-mentioned information providing device.

An information receiving means which the above-mentioned tunneling is used and receives the above-mentioned multi cast data via the above-mentioned information repeating installation from the above-mentioned information providing device which is the node for which it was searched by the above-mentioned information providing device, or the 2nd information sender receiver terminal.

[Claim 7]According to information that the above-mentioned information providing device has distributed the above-mentioned multi cast data, the above-mentioned information transmission means, By supplying multi-cast-data request-to-receipt information to demand, receiving the above-mentioned multi cast data from the above-mentioned information providing device, The information sender receiver terminal according to claim 6 transmitting connection request information and self position information which require connection with the above-mentioned multicast networks to the above-mentioned information providing device.

[Claim 8]Have an operation input means as which request-to-receipt information which requires reception of the above-mentioned multi cast data is inputted, and the above-mentioned information transmission means, The information sender receiver terminal according to claim 6 transmitting the

above-mentioned connection request information and self position information to the above-mentioned information providing device by supplying the above-mentioned request-to-receipt information from the above-mentioned operation input means.

[Claim 9]It belongs to multicast networks to which multi cast data reproduced by only information sender receiver terminal which requires reception are transmitted, The above-mentioned multi cast data, The above-mentioned multi cast data in which tunneling which carries out interconnection was used between networks corresponding to the above-mentioned multicast networks via information repeating installation treated as unicast data directly transmitted for every information sender receiver terminal from self, In an information providing device which transmits to the 1st information sender receiver terminal that requires reception of the above-mentioned multi cast data, According to connection request information which requires connection with the above-mentioned multicast networks received from an information sender receiver terminal of the above 1st, It has a search means which searches for a node which an information sender receiver terminal of the above 1st connects to the above-mentioned multicast networks based on this position information on the 1st information sender receiver terminal received from an information sender receiver terminal of the above 1st, An information providing device characterized by transmitting the above-mentioned multi cast data to an information sender receiver terminal of the above 1st via the above-mentioned information repeating installation using the above-mentioned tunneling.

[Claim 10]The information providing device according to claim 9 which is provided with the following and characterized by transmitting the above-mentioned multi cast data to an information sender receiver terminal of the above 1st via the above-mentioned information repeating installation using the above-mentioned tunneling.

A recognition means to recognize IP (Internet Protocol) address of an information providing device connected to the above-mentioned multicast networks, or the 2nd information sender receiver terminal according to connection request information which received the above-mentioned search means from an information sender receiver terminal of the above 1st.

An IP address recognized by this recognition means.

A comparison means to compare an IP address of an information sender receiver terminal of the above 1st.

A detection means to detect an information providing device or the 2nd information sender receiver terminal which is a node to the above-mentioned multicast networks based on a comparison result compared by this comparison means.

[Claim 11]The information providing device according to claim 9 provided with a course disappearance means to extinguish a course of a network connected by information sender receiver terminal of the above 1st according to fulfilling predetermined conditions.

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the network system, the information sender receiver terminal, information providing device, and the network construction method of transmitting the

multicast packet to the information sender receiver terminal etc., for example in IP (Internet Protocol) network.

[0002]

[Description of the Prior Art]In the conventional IP multicast networks, the multicast packet was transmitted using two methods described below.

[0003]In the 1st method, the information repeating installation (henceforth a router) of the IP network where an information sender receiver terminal (henceforth a client) belongs serves as the multicast router. Like this 1st method, if the router is multicasting correspondence, any problem cannot be found, and if the application software corresponding to multicasting is used, a multicast packet can be transmitted and received as it is.

[0004]IP unicast router which has transmitted only the unicast packet is made to pass the multicast packet which performed this IPinIP capsuling by performing IPinIP capsuling to a multicast packet in the 2nd method. Here, IPinIP capsuling means encapsulating a multicast packet in the usual unicast packet. IP unicast router which intervenes in the middle by using tunneling called what is called an encapsulation tunnel like these 2nd method, Since a multicast packet can be treated as a unicast packet, this encapsulated multicast packet can be transmitted and received. As for IP multicast packet which passes through an encapsulation tunnel, it is the feature that the starting point and a terminal point IP address are an IP address of the multicast router of tunnel both ends.

[0005]

[Problem(s) to be Solved by the Invention]However, it is almost the case for most routers on the present Internet not to correspond to multicasting, but to access multicast networks by the tunneling which was used in the case of the above-mentioned method [2nd].

[0006]In the case of these method [2nd], the multicast router and the called program are transmitting by changing a multicast packet into a unicast packet. And it must be known where these multicast routers should just transmit a multicast packet as a unicast packet mutually. Therefore, when a different individual and organizations build multicast networks, it is necessary to check mutually only not only in an IP address till fine places, such as a policy of operation and a measure at the time of a fault occurrence, and time and a know how are required.

[0007]Then, by making this invention in view of such the actual condition, and connecting the information sender receiver terminal which is not connected to multicast networks at the node to the optimal multicast networks, It aims at providing the network system, the information sender receiver terminal, information providing device, and the network construction method of keeping from applying great load to a network.

[0008]

[Means for Solving the Problem]In order to attain the above-mentioned purpose, a network system concerning this invention, To multicast networks to which multi cast data reproduced by only information sender receiver terminal which requires reception are transmitted. The above-mentioned multi cast data in which tunneling which carries out interconnection was used between networks corresponding to these multicast networks as unicast data directly transmitted for every information sender receiver terminal from an information providing device. The 1st information sender receiver terminal to connect via information repeating installation treated the above-mentioned multi cast data,

5

In a network system which builds a course of a network received from an information providing device or the 2nd information sender receiver terminal which belongs to the above-mentioned multicast networks and holds the above-mentioned multi cast data, An information sender receiver terminal of the above 1st is provided with an information transmission means which transmits connection request information and self position information which require connection with the above-mentioned multicast networks to the above-mentioned information providing device, and the above-mentioned information providing device according to connection request information received from an information sender receiver terminal of the above 1st, It has a search means which searches for a node which an information sender receiver terminal of the above 1st connects to the above-mentioned multicast networks based on position information on the 1st information sender receiver terminal that received from an information sender receiver terminal of the above 1st, An information providing device or the 2nd information sender receiver terminal which is the node for which it was searched by the above-mentioned search means transmits the above-mentioned multi cast data to an information sender receiver terminal of the above 1st via the above-mentioned information repeating installation using the above-mentioned tunneling.

[0009]In this network system, the 1st information sender receiver terminal, Transmit to an information providing device and connection request information and self position information which require connection with multicast networks an information providing device, It searches for a node which the 1st information sender receiver terminal connects to multicast networks based on position information on the 1st information sender receiver terminal that received from the 1st information sender receiver terminal according to connection request information received from the 1st information sender receiver terminal. And an information providing device or the 2nd information sender receiver terminal which is the node for which it was searched by an information providing device transmits multi cast data to the 1st information sender receiver terminal via information repeating installation using tunneling.

[0010]This invention an information sender receiver terminal concerning this invention, From an information providing device or the 2nd information sender receiver terminal which belongs to multicast networks to which multi cast data reproduced by only information sender receiver terminal which requires reception are transmitted, and holds the above-mentioned multi cast data. The above-mentioned multi cast data, The above-mentioned multi cast data in which tunneling which carries out interconnection was used between networks corresponding to the above-mentioned multicast networks as unicast data directly transmitted for every information sender receiver terminal from an information providing device. An information sender receiver terminal which receives via information repeating installation treated is characterized by comprising:

An information transmission means which transmits connection request information and self position information which require connection with the above-mentioned multicast networks to the above-mentioned information providing device.

An information receiving means which the above-mentioned tunneling is used and receives the above-mentioned multi cast data via the above-mentioned information repeating installation from the above-mentioned information providing device which is the node for which it was searched by the above-mentioned information providing device, or the 2nd information sender receiver terminal.

[0011]In this information sender receiver terminal, connection request information and self position information which require connection with multicast networks are transmitted to an information providing device, Tunneling is used and multi cast data are received via information repeating installation from an information providing device which is the node for which it was searched by an information providing device, or the 2nd information sender receiver terminal.

[0012]An information providing device concerning this invention belongs to multicast networks to which multi cast data reproduced by only information sender receiver terminal which requires reception are transmitted, The above-mentioned multi cast data, The above-mentioned multi cast data in which tunneling which carries out interconnection was used between networks corresponding to the above-mentioned multicast networks via information repeating installation treated as unicast data directly transmitted for every information sender receiver terminal from self, In an information providing device which transmits to the 1st information sender receiver terminal that requires reception of the above-mentioned multi cast data, According to connection request information which requires connection with the above-mentioned multicast networks received from an information sender receiver terminal of the above 1st, It has a search means which searches for a node which an information sender receiver terminal of the above 1st connects to the above-mentioned multicast networks based on this position information on the 1st information sender receiver terminal received from an information sender receiver terminal of the above 1st, The above-mentioned multi cast data are transmitted to an information sender receiver terminal of the above 1st via the above-mentioned information repeating installation using the above-mentioned tunneling.

[0013]According to connection request information which requires connection with the above-mentioned multicast networks received from the 1st information sender receiver terminal in this information providing device, Based on position information on this 1st information sender receiver terminal that received from the 1st information sender receiver terminal, the 1st information sender receiver terminal searches for a node linked to multicast networks, and transmits multi cast data to the 1st information sender receiver terminal via information repeating installation using tunneling.

[0014]Further again a network construction method concerning this invention, To multicast networks to which multi cast data reproduced by only information sender receiver terminal which requires reception are transmitted. The above-mentioned multi cast data in which tunneling which carries out interconnection was used between networks corresponding to these multicast networks as unicast data directly transmitted for every information sender receiver terminal from an information providing device. The 1st information sender receiver terminal to connect via information repeating installation treated the above-mentioned multi cast data, In a network construction method of building a course of a network received from an information providing device or the 2nd information sender receiver terminal which belongs to the above-mentioned multicast networks and holds the above-mentioned multi cast data, An information sender receiver terminal of the above 1st transmits to the above-mentioned information providing device, and connection request information and self position information which require connection with the above-mentioned multicast networks the above-mentioned information providing device, It searches for a node which an information sender receiver terminal of the above 1st connects to the above-mentioned multicast networks based on position information on the 1st information sender receiver terminal that received from an information sender

7

receiver terminal of the above 1st according to connection request information received from an information sender receiver terminal of the above 1st, An information providing device or the 2nd information sender receiver terminal which is the node for which it was searched by the above-mentioned information providing device builds a network course in which an information sender receiver terminal of the above 1st receives the above-mentioned multi cast data via the above-mentioned information repeating installation, using the above-mentioned tunneling.

[0015]In this network construction method, the 1st information sender receiver terminal, Transmit to an information providing device and connection request information and self position information which require connection with multicast networks an information providing device, It searches for a node which the 1st information sender receiver terminal connects to multicast networks based on position information on the 1st information sender receiver terminal that received from the 1st information sender receiver terminal according to connection request information received from the 1st information sender receiver terminal. And an information providing device or the 2nd information sender receiver terminal which is the node for which it was searched by an information providing device builds a network course in which the 1st information sender receiver terminal receives multi cast data via information repeating installation, using tunneling.

[0016]
[Embodiment of the Invention]Hereafter, the embodiment which applied this invention is described, referring to Drawings.

[0017]The network system which is the embodiment which applied this invention builds a system, for example using the Internet. The network system which is the embodiment which applied this invention is shown in drawing 1.

[0018]The network system 1 is provided with the following.
The information providing device (henceforth a server) 2 and the information repeating installation (henceforth a router) 3 which belong to the network A as shown in this drawing 1.
The router 4 belonging to the network B.
The information sender receiver terminal (henceforth a client) 5 belonging to the network C.
In the network system 1 of an initial state, IP (Internet Protocol) multicast networks (henceforth multicast networks) shall not be built, but each of these devices shall be connected in the unicast network.

[0019]Here, an IP multicast (henceforth multicasting) means that the server of a transmitting agency transmits information only to the singular number or two or more clients which require reception. Multicasting assigns the group address called the class D (class D) to all the clients which have joined a certain specific group, and, specifically, means that the router corresponding to multicasting reproduces data automatically, and transmits only to a required address. The group says the logical group address which exists only during operation between the sites of the Internet which is performing transmission and/or reception of multi cast data with a specific class D address.

[0020]On the other hand, a unicast means that the server of a transmitting agency transmits information directly for every client of a receiver. Specifically, a unicast means transmitting one data at a time for every client of the receiver from which the server of a transmitting agency reproduces the data of the number of the clients of a receiver, and the same number, and serves as an address.

8

[0021]Next, each device with which the network system 1 is equipped is explained.

[0022]The server 2 is provided with the following.

The central controlling part 2a which operates based on the server program corresponding to multicasting.

Multicasting control-section 2b which builds a network course so that external organization and communication of multicasting can be performed.

The database 2c with which multi cast data (henceforth a multicast packet) etc. are memorized.

The communications department 2d which mediates the communication of information with the server 2 and the client 5.

[0023]The central controlling part 2a is CPU (Central Processing Unit), for example, and operates based on the server program corresponding to multicasting stored in the inside. The central controlling part 2a specifically to multicasting control-section 2b connected with the multicasting control section 5d mentioned later by tunneling as multicast networks. The multicast packet acquired from the database 2c is made to transmit to the multicasting control section 5d via the communications department 2d, the router 3, the router 4, and the communications department 5f.

[0024]Multicasting control-section 2b is a multicast router, for example, and controls based on the multicasting program (henceforth mrouted) which performs path control of the multicast packet stored in the inside. Based on mrouted which uses the protocol used for multicast routers, such as IGMP (Internet Group Management Protocol) mentioned later, for example, multicasting control-section 2b specifically, Since the information how far the multicast packet has reached is always mutually checked with other multicasting control sections, it is recognized how far multicast networks spread out. That is, since the multicasting control sections with which the server 2 and the client 5 are equipped check where other multicasting control sections always exist and they suit, each multicasting control section always holds the information where other multicasting control sections exist.

[0025]According to the connection request information which requires connection with the multicast networks received from the client 5 which is the 1st client that is not connected to multicast networks as multicasting control-section 2b is shown in <u>drawing 2</u>, Recognize the IP address of the client 6 which is the server 2 or the 2nd client which is connected to multicast networks and holds the multicast packet, and This recognized IP address, The IP address of the client 5 is compared and the server 2 or the client 6 which is a node to multicast networks is detected based on this compared comparison result. Namely, in the multicast networks which exist at present using the optimal node heuristics mentioned later, multicasting control-section 2b in a multicasting control section while distributing a multicast packet, It searches for the multicasting control section which is a node to the multicast networks nearest to the client 5 in network. Multicasting control-section 2b by using the below-mentioned mrinfo specifically, The IP address in which the multicasting control section connected to multicast networks exists is listed, Among the IP addresses which are this listed 32 bit length, as much as possible from the bit of the higher rank of the IP address of the multicasting control section 5d a match, In the multicast networks which exist at present, it is judged as the multicasting control section which is a node to the multicast networks nearest to the client 5 in network in a multicasting control section while distributing a multicast packet. This judging method is called the optimal node heuristics.

[0026]Here, an IP address is the information on 32 bit length which comprised a class from A to E, a network number for identifying a network, and a host number for identifying the host on this network. mrinfo is a command used when looking through the place (IP address) where the multicast router connected to multicast networks exists. The version number of mrouted with which mrinfo is specifically equipped at the multicasting control section which is a multicast router, The information how this multicasting control section is connected to another multicasting control section via the tunnel, the information about the setting-out specification of a tunnel, etc. are included. And if this mrinfo is used, either the multicasting control section in the network with which he belongs, or the multicasting control section on multicast networks can obtain and display the information about mrouted.

[0027]The database 2c has memorized the multicast packet etc. which the server 2 distributes to client 5 grade.

[0028]The communications department 2d performs agency etc. of communication of the information that the multicast packet which multicasting control-section 2b acquired from the database 2c is transmitted to the client 5 for example.

[0029]The router 3 and the router 4 request a data transfer from the following router, when saying the device which relays the data which flows on a network to other networks and performing data exchange via two or more networks. That is, the router 3 and the router 4 hold the mechanism of exchanging mutually the information to which network the network with which oneself belongs is further connected at that point, and request a data transfer to the following router based on this information. It is a router of any one unicast correspondence of the router 3 and the router 4 at least. In the network system 1, the router of unicast correspondence of both the router 3 and the router 4 is used.

[0030]As mentioned above using <u>drawing 2</u>, the client 5 for example, They are the client 5 which is the 1st client that is not connected to multicast networks, or the client 6 which is the 2nd client that is connected to the above-mentioned multicast networks and holds multi cast data. The client 5 is provided with the following.

The input part 5a into which information is inputted by operation by a user, the outputting part 5b which outputs the information provided to a user.

The central controlling part 5c which controls the function of each treating part, such as these input parts 5a and the outputting part 5b.

The multicasting control section 5d which makes a judgment whether reception of a multicast packet is possible etc. by IGMP mentioned later.

The storage parts store 5e the multicast packet etc. which received from the server 2 are remembered to be, and the communications department 5f which mediates the communication of information with the server 2 and the client 5.

It has the function as the client 5 also with the same client 6.

[0031]The input parts 5a are a keyboard, a mouse, etc., for example, a user by accessing to a WorldWide Web (henceforth WWW) site, When it gets to know that the server 2 has distributed the multicast packet and this user wishes distribution of this multicast packet from the server 2, The multicast packet distribution request information which requires distribution of the multicast packet from the server 2 is inputted by operation by a user.

[0032]The outputting parts 5b are display devices, such as a liquid crystal display, for example, and

display the information based on the multicast packet which received from the server 2, etc.

[0033]The central controlling part 5c is CPU, for example, and operates based on the application program corresponding to multicasting stored in the inside. The central controlling part 5c specifically starts the application program corresponding to multicasting based on the multicast packet distribution request information which was supplied from the input part 5a and which is mentioned later, An IGMP message is published in the network with which the client 5 belongs, and reception of the same multicast packet as the multicast packet which the server 2 which exists in this network has distributed is tried.

[0034]Here, IGMP means the protocol for controlling the group of the host constituted in order to receive distribution of a multicast packet in multicasting. This IGMP is used in order to make the multicasting control section which adjoins on a predetermined network recognize the intervention to the specified host group, in order that a router may recognize existence of the member on the subnetwork by which direct continuation was carried out to itself. That is, IGMP is used in order that the host on a predetermined local subnetwork may make an adjoining multicasting control section recognize the thing of the multicast group to which he belongs.

[0035]The multicasting control section 5d is a multicast router, for example, and if an IGMP message is supplied from the above-mentioned central controlling part 5c, it will judge whether reception of a multicast packet is possible by this IGMP. When the multicast packet request-to-receipt information and the IP address information on multicasting control-section 2b which are required as the multicasting control section 5d receiving a multicast packet are supplied from the central controlling part 5c, The multicast-networks connection request information which is information which requires connection with multicast networks is transmitted to multicasting control-section 2b of the server 2 belonging to the network A as a unicast packet by performing IPinIP capsuling.

[0036]Here, IPinIP capsuling means encapsulating a multicast packet in the usual unicast packet. The lineblock diagram of the message of the IPinIP encapsulation packet which is a packet in which this IPinIP capsuling was performed is shown in drawing 3. This IPinIP encapsulation packet is a unicast packet which comprised a unicast header area and a multicast packet field, as shown in drawing 3. Specifically the unicast header area of an IPinIP encapsulation packet, The destination address part A which shows the address of the unicast packet which is this IPinIP encapsulation packet. It comprises a type field etc. which show the information on whether the transmission source address part B which shows the transmitting origin of a unicast packet, and this unicast packet are multicast packets in fact. The multicast packet field of an IPinIP encapsulation packet, It comprises the transmission source address part D which shows the transmitting origin of the destination address part C and multicast packet which show the address of a multicast packet, a multi-cast-data part in which multi cast data are stored, etc. And the unicast router which intervenes in the middle by using IPinIP capsuling and tunneling called what is called an encapsulation tunnel, Since a multicast packet can be treated as a unicast packet, this encapsulated multicast packet can be transmitted and received.

[0037]The storage parts store 5e memorizes the multicast packet etc. which received via the router 3, the router 4, and the communications department 5f from the server 2, for example.

[0038]The communications department 5f performs agency etc. of communication of information which says that the multicasting control section 5d receives a multicast packet from the server 2, for example.

[0039]In the network system 1 constituted as mentioned above, multicasting control-section 2b of the server 2 discovers the nearest multicasting control section in network from this client 5 according to the demand from the client 5. The multicasting control section 5d is connected by this multicasting control section and tunneling that were discovered. And the central controlling part 5c makes the multicasting control section 5d receive a multicast packet from the server 2.

[0040]Next in the network system 1, multicasting control-section 2b of the server 2 discovers the nearest multicasting control section in network from the client 5, This multicasting control section and multicasting control section 5d of the client 5 that were discovered are connected by tunneling, and the flow of a series of processings until the client 5 receives a multicast packet from the server 2 is explained according to the flow chart shown in drawing 4.

[0041]As a premise, with the network system 1 of an initial state, multicast networks shall not be built but each of these devices shall be connected in the unicast network. Multicasting control-section 2b, the router 3, the router 4, and the multicasting control section 5d assume that it is always operating. In the same network, at least one multicasting control section must be operating. For example, in the network system 1 shown in drawing 1, multicasting control-section 2b and the multicasting control section 5d must be operating. The IP address of multicasting control-section 2b which is operating within the server 2 shall be beforehand inputted into the application program with which the central controlling part 5c of the client 5 is equipped by the user using a keyboard etc.

[0042]First, when a user accesses to a WWW site in Step S1 of drawing 4, The multicast packet distribution request information which recognizes that the server 2 has distributed the multicast packet and as which this user demands distribution of the multicast packet from the server 2, When it inputs using the keyboard etc. of the input part 5a with which the client 5 was equipped, the above-mentioned multicast packet distribution request information is supplied to the central controlling part 5c from the input part 5a.

[0043]Then, in Step S2, the central controlling part 5c starts the application program corresponding to multicasting according to the multicast packet distribution request information supplied from the input part 5a. The central controlling part 5c supplies the usual IGMP message in the network C issue and here at the multicasting control section 5d based on this started application program, Reception of the same multicast packet as the multicast packet which the server 2 which exists in the network C has distributed is tried.

[0044]Then, in Step S3, the multicasting control section 5d to which an IGMP message is supplied judges whether reception of the above-mentioned multicast packet is possible by this IGMP.

[0045]Since multicast networks are not built in the network system 1 in the flow chart shown in this drawing 4 as mentioned above, the multicasting control section 5d is not anywhere connected as multicast networks. For this reason, since an IGMP message disappears within the network C, the multicasting control section 5d cannot receive the multicast packet which the server 2 has distributed. Therefore, the central controlling part 5c for example, by supplying the multicast packet non-receipt information which tells that a multicast packet was not able to be received from the multicasting control section 5d, In order to judge reception of the above-mentioned multicast packet to be impossible, processing progresses to step S4.

[0046]However, multicasting control-section 2b of the server 2 and the multicasting control section 5d

of the client 5 in the network system 1 of the initial state mentioned above as a premise, When connected as multicast networks, the multicasting control section 5d can receive a multicast packet via multicast networks from the server 2. Therefore, the central controlling part 5c in this case for example, by supplying the multicast packet receipt information which tells that a multicast packet is receivable from the multicasting control section 5d, In order to judge reception of the above-mentioned multicast packet to be possible, processing progresses to Step S7.

[0047]In step S4, the central controlling part 5c to which multicast packet non-receipt information was supplied from the multicasting control section 5d, The multicast packet request-to-receipt information required as receiving a multicast packet from the server 2 and the information on the IP address of multicasting control-section 2b are supplied to the multicasting control section 5d. The multicasting control section 5d to which these multicast packet request-to-receipt information and IP address information were supplied from the central controlling part 5c, The multicast-networks connection request information which is information which requires connection with multicast networks by performing IPinIP capsuling as a unicast packet, It transmits to multicasting control-section 2b via the communications department 5f, the router 4, the router 3, and the communications department 2d.

[0048]Then, multicasting control-section 2b which received multicast-networks connection request information from the multicasting control section 5d in Step S5, In the multicast networks which exist at present using the optimal node heuristics mentioned above, in a multicasting control section while distributing a multicast packet, It searches for the multicasting control section which is a node to the multicast networks nearest to the client 5 in network.

[0049]Multicasting control-section 2b by using mrinfo specifically, The IP address in which the multicasting control section connected to multicast networks exists is listed, Among the IP addresses which are this listed 32 bit length, as much as possible from the bit of the higher rank of the IP address of the multicasting control section 5d a match, In the multicast networks which exist at present, it is judged as the multicasting control section which is a node to the multicast networks nearest to the client 5 in network in a multicasting control section while distributing a multicast packet. Here, he judges multicasting control-section 2b to be a node to the multicast networks nearest to the client 5 in network.

[0050]The case where multicasting control-section 2b is expected that discovery of the multicasting control section nearest to the client 5 in network takes time, When it is required to make a specific multicasting control section use it, it may set up choose from some multicasting control sections beforehand.

[0051]Then, multicasting control-section 2b judged that there is a node to the multicast networks nearest to the client 5 in network by itself in Step S6, The connection preparation demand information required as making the preparations connected with the multicasting control section 5d as multicast networks is published to itself. Multicasting control-section 2b which received this issue makes the preparations which receive the connection request information which requires the connection as multicast networks via the communications department 5f, the router 4, the router 3, and the communications department 2d from the multicasting control section 5d. Multicasting control-section 2b will transmit ACK (acknowledgement) to the multicasting control section 5d via the communications department 2d, the router 3, the router 4, and the communications department 5f, if the preparation

which receives this connection request information is completed.

[0052]The multicasting control section 5d which received multicasting control-section 2b to ACK is connected with multicasting control-section 2b which is ready for connection by tunneling as multicast networks.

[0053]Then, in Step S7 the central controlling part 2a, To multicasting control-section 2b connected with the multicasting control section 5d by tunneling as multicast networks. The multicast packet acquired from the database 2c is made to transmit to the multicasting control section 5d via the communications department 2d, the router 3, the router 4, and the communications department 5f. And the multicasting control section 5d supplies this multicast packet that received to the central controlling part 5c. The central controlling part 5c supplies this supplied multicast packet to the storage parts store 5e, and makes it memorize finally. Or the central controlling part 5c makes the information acquired from the supplied multicast packet output to the outputting part 5b by supplying this supplied multicast packet to the outputting part 5b.

[0054]By being processed as mentioned above, it can connect by tunneling as nearest multicasting control-section 2b in network, and multicast networks, and the client 5 can receive a multicast packet from this multicasting control-section 2b.

[0055]Although the inside of the client 5 is equipped with the multicasting control section 5d in a series of processings using the flow chart shown in drawing 4 mentioned above, Like [if the IP address in which the multicasting control section 5d exists is known] the network system 10 shown in drawing 5, A client may be divided into the client 15 which is not equipped with the multicasting control section 5d, and the client 16 equipped with the multicasting control section 5d. Although the inside of the server 2 is equipped with multicasting control-section 2b in a series of processings using the flow chart shown in drawing 4 mentioned above, As long as the IP address in which multicasting control-section 2b exists is known, a server may be divided into the server 21 which is not equipped with multicasting control-section 2b, and the server 22 equipped with multicasting control-section 2b like the network system 20 shown in drawing 6. Although the inside of the server 2 and the client 5 is equipped with multicasting control-section 2b and the multicasting control section 5d, respectively in a series of processings using the flow chart shown in drawing 4 mentioned above, If the IP address in which multicasting control-section 2b and the multicasting control section 5d exist is known, The server 31 which is not equipped with multicasting control-section 2b in the server and the client like the network system 30 shown in drawing 7, It may divide into the server 32 equipped with multicasting control-section 2b, the client 35 which is not equipped with the multicasting control section 5d, and the client 36 equipped with the multicasting control section 5d.

[0056]In a series of processings using the flow chart shown in drawing 4 mentioned above. Although 2 deer example of multicasting control-section 2b and the multicasting control section 5d is not carried out, the multicasting control section provided with mrouted, For example, by having a multicasting control section etc. which have mrouted3 from the multicasting control section 5d downstream in network to multicasting control-section 2b, When the multicasting control section 5d receives connection request information from the multicasting control section which has mrouted3 of the lower stream, multicast networks may be expanded recursively.

[0057]In a series of processings using the flow chart shown in drawing 4, some courses of the multicast

14

networks built through processing which was mentioned above may be extinguished after fixed time using a TTL (Time To Live) value etc. Or when a multicasting control section suspends operation or the computer etc. by which the multicasting control section is operating secede from multicast networks, Some courses of the multicast networks built through processing which was mentioned above may be extinguished after fixed time. And in the network system 1 where reception of the multicast packet became impossible when it did in this way and some courses of multicast networks were extinguished. The then optimal multicast networks may be reconstituted by performing processing which was again mentioned above.

[0058]As stated above, in the network system 1 which is the embodiment which applied this invention. Even if it is a client belonging to the network which has not connected with multicast networks, a multicast packet is receivable from the server belonging to multicast networks, etc. by building multicast networks automatically.

[0059]Since multicast networks are built automatically, the user who is not knowledgeable about multicasting can also receive a multicast packet, without applying great load to a network.

[0060]Since multicast networks are built automatically and some courses of multicast networks are extinguished automatically, the user does not need to manage multicast networks.

[0061]When a user can participate in multicast networks freely using a client, the application corresponding to multicasting can increase and the traffic on the Internet crowded with services of the present unicast can be reduced further again.

[0062]If the client belonging to a predetermined network receives a multicast packet from a server further again, Other clients belonging to the same network as this predetermined network can receive the same multicast packet from the client belonging to this predetermined network.

[0063]Since a recursive expansion of multicast networks is possible further again, it can prevent the acquisition request of the multicast packet of SABAHE concentrating. Namely, if there is a client which has received the multicast packet of which a user expects reception near the client which a user possesses, A multicast packet can be received by receiving a multicast packet from this client, without applying a burden to the upper stream in network to a server.

[0064]In the network system 1, a multicasting control section, When reception of the client near the network with which he belongs of the multicast packet from the server 2 is required, connection by tunneling may be additionally made between the client, and a multicast packet may be transmitted.

[0065]

[Effect of the Invention]As explained above, according to the network system, the information sender receiver terminal, information providing device, and the network construction method concerning this invention, since multicast networks are built automatically, multi cast data can be received, without applying great load to a network.

[0066]According to the network system, the information sender receiver terminal, information providing device, and the network construction method concerning this invention. Since multicast networks are built automatically and some courses of multicast networks are extinguished automatically, the operator does not need to manage multicast networks.

[0067]According to the network system, the information sender receiver terminal, information providing device, and the network construction method concerning this invention. If the information sender

receiver terminal belonging to a predetermined network receives multi cast data from an information providing device, Other information sender receiver terminals belonging to the same network as this predetermined network can receive the same multi cast data from the information sender receiver terminal belonging to this predetermined network.

[0068]According to the network system, the information sender receiver terminal, information providing device, and the network construction method concerning this invention, since a recursive expansion of multicast networks is possible, it can prevent the acquisition request of the multi cast data of information providing device HE concentrating further again. Namely, if there is an information sender receiver terminal which has received the multi cast data in which an operator wishes to receive near the information sender receiver terminal which an operator possesses, Multi cast data can be received by receiving multi cast data from this information sender receiver terminal, without applying a burden to the upper stream in network to an information providing device.